IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN THE UNITED S

Confirmation No.: 1766

Group Art Unit: 2834

Examiner: Budd, Mark Osborne

Docket No.: 062020-1430

For: Piezoelectric On Semiconductor-On-Insulator Microelectromechanical Resonators And Methods Of Fabrication

### INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450

Ayazi, et al.

Seriál No.: 10/631,948

Filed: 7-31-03

Sir:	This inf	formation	n disclosure statement is filed in acco	ordance with 37 C F.R. 88 1 56 1 9	7 and 1 98 and enecifically:			
		This information disclosure statement is filed in accordance with 37 C.F.R. §§ 1.56, 1.97, and 1.98, and specifically  under 37 CFR 1.97(b), or (within Three months of filing national application; or date of entry of international application; or before mailing date of first office action on the merits; whichever occurs last)						
	$\boxtimes$	under 3'	7 CFR 1.97(c) together with either a: Statement Under 37 C.F.R. 1.97(e), of a \$180.00 fee under 37 CFR 1.17(p), (After the CFR 1.97(b) time period, but before the occurs first)	or	ver			
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		under 3'	7 CFR 1.97(d) together with a: Statement under 37 CFR 1.97(e), and a \$180.00 petition fee set forth in 37 ( (Filed after final office action or notice of allowand issue fee)	CFR 1.17(p).	180.00 QP			
	Enclosed	d is a che	ck in the amount of \$ .					
	Enclosed is Credit Card Payment Form (PTO-2038) in the amount of \$180.00.							
		uired to I	to deposit account . At an Deposit Account 20-0778 pursuant to 3 Deposit Account No. 20-0778.	y time during the pendency of this ap 37 CFR 1.25. The Commissioner is				
	Applicant(s) submit herewith Form PTO 1449A - Information Disclosure Statement by Applicant together with copies (where required) of patents, publications or other information of which applicant(s) are aware, which applicant(s) believe(s) may or may not be material to the examination of this application and for which there may be a duty to disclose in accordance with 37 CFR 1.56. As required by 37 C.F.R. §1.98(a), a legible copy of each document is provided.							
	A concise explanation of the relevance of foreign language patents, foreign language publications and other foreign language information listed on PTO Form 1449, as presently understood by the individual(s) designated in 3 CFR 1.56(c) most knowledgeable about the content is given on the attached sheet, or where a foreign language patent i cited in a search report or other action by a foreign patent office in a counterpart foreign application, an English language							

version of the search report or action which indicates the degree of relevance found by the foreign office is listed on the form PTO 1449 and is enclosed herewith.

The following rights are reserved by the Applicant(s): the right to establish the patentability of the claimed invention over any of the listed documents should they be applied as reference, and/or the right to prove that some of these documents may not be enabling for the teachings they purport to offer.

This statement should not be construed as a representation that an exhaustive search has been made, or that information more material to the examination of the present application does not exist. Any statements or identifications regarding the relevance of any portion(s) of cited references should not be construed as a representation that the most relevant portion(s) have been identified, and the absence of such statements or identifications should not be construed as representations that there are no relevant portion(s). The Examiner is specifically requested not to rely solely on the materials submitted herewith. The Examiner is requested to conduct an independent and thorough review of the documents, and to form independent opinions as to their significance.

It is requested that the information disclosed herein be made of record in this application and that the Examiner initial and return a copy of the enclosed PTO-1449 to indicate the documents have been considered.

Respectfully Submitted,

THOMAS, KAYDEN, HORSTEMEYER

& RISLEY, L.L.P.

By:

Scott A. Horstemeyer, Reg. No. 34,183

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### **CERTIFIED MAILING**

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INFORMATION DISCLOSURE CITATION

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Attorney Docket No. Serial No.: 062020-1430 10/631,948

Applicant Ayazi, et al.

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			U.S. PA	TENT DOCUMEN	TS			
Examiner Initials	Item	Document Number	Date	Name		Class	Subclass	Filing Date If Appropriate
	Α	3,513,356		Newell				6-27-67
	В	3,634,787	1-11-72	Newell		333	72	1-23-68
	C	5,162,691	11-10-92	Mariani, et al.		310	321	1-22-91
	D	5,426,070	6-20-95	Shaw, et al.		437	203	5-26-93
	E	5,491,604	2-13-96	Nguyen, et al.		361	278	12-11-92
	F	5,587,620	12-24-96	Ruby, et al.		310	346	12-21-93
	G	5,589,082	12-31-96	Lin, et al.		216	2	6-7-95
	Н	5,663,505	9-2-97	Nakamura		73	702	5-8-96
	I	5,719,073	2-17-98	Shaw, et al.		437	228	9-27-94
	J	5,846,849	12-8-98	Shaw, et al.		438	52	2-24-97
	K	5,847,454	12-8-98	Shaw, et al.		257	734	9-22-97
		OTHER DOCUM	ENTS (Includ	ling Author, Title, D	ate, Pertinent P	ages, etc	.)	
	L	Ayazi, et al.; Capacitive Resonators and Methods of Fabrication; U.S. Patent Application Serial No. 10/632,176; filed July 31, 2003						
	<ul> <li>Ma, et al.; Sacrificial Layer Technique to Make Gaps in MEMS Applications; US Patent Application Publica 2003/0006468 A1; filed June 27, 2001.</li> <li>N Bourgeois, et al.; Design of Resonators for the Determination of the Temperature Coefficients of Elastic Cons Monocrystalline Silicon; 1997 IEEE International Frequency Control Symposium; Orlando, FL.; Pages 791-7</li> </ul>						ublication No.:	
							Constants of 791-799	
O Mihailovich, et al.; Dissipation Measurements of Vacuum-Operated Single-Crystal Silicon Micrord and Actuators A 50 (1995); Pages 199-207  P Roszhart, et al.; The Effects of Thermoelastic Internal Friction on the Q of Micromachined Silicon Solid State Sensor and Actuator Workshop, Hilton Head, SC 6/4-7/90 (1990) pp 489-494						Microresona	tors, Sensors	
						Silicon Reso	licon Resonators; IEEE	
	Q	Q Cleland, et al.; Fabrication of High Frequency Nanometer Scale Mechanical Resonators from Bulk Si Crystals; Condensed Matter Physics, CA Inst. of Tech.; Received June 21, 1996, Pages 2653-2655						
	R	No, et al.; The HARPSS Process for Fabrication of Nano-Precision Silicon Electromechanical Resonators; IEEE Conf. of Nanotechology; October 30, 2001; Pages 489-494						

\* EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP § 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to the applicant.

*J*+.

University; Received May 7, 2001; Pages 67-72

Water, et al.; "Physical and Structural Properties of ZnO Sputtered Films"; Dept. of EE, National Cheng Kung

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## INFORMATION DISCLOSURE CITATION

Attorney Docket No. Serial No.: 10/631,948

Applicant Ayazi, et al.

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Filing Date Group 7-31-03 2834

S. PATENT DOCUMENTS

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			U.S. PA	TENT DOCUMENTS						
Examiner Initials	Item	Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate			
	Т	5,873,153	2-23-99	Ruby, et al.	29	25.35	8-27-96			
	U	5,884,378	3-23-99	Dydyk	29	25.35	7-22-96			
	V	5,894,647	4-20-99	Lakin	29	25.35	6-30-97			
	W	5,914,801	6-22-99	Dhuler, et al.	359	230	9-27-96			
	Х	5,976,994	11-2-99	Nguyen, et al.	438	795	6-13-97			
	Y	5,998,906	12-7-99	Jerman, et al.	310	309	8-17-98			
	Z	6,000,280	12-14-99	Miller, et al.	73	105	3-23-98			
	a	6,051,866	4-18-00	Shaw, et al.	257	417	8-11-98			
	ь	6,060,818	5-9-00	Ruby, et al.	310	363	6-2-98			
	С	6,067,858	5-30-00	Clark, et al.	73	504.16	5-30-97			
	đ	6,087,747	7-11-00	Dhuler, et al.	310	90	4-1-99			
		OTHER DOCUM	MENTS (Includ	ding Author, Title, Date, Pertinent Po	ages, etc.)		<b>.</b>			
	e	DeVoe; Piezoelectric Thin Film Micromechanical Beam Resonators, Sensors and Actuators, A 88; 2001; pp 263-272								
	f	Bhave, et al.; Poly-Sige: A High-Q Structural Material for Integrated RF Mems; Solid-State Sensor, Actuator and Microsystems Workshop, Hilton Head Island, South Carolina, June 2-6, 2002; pp 34-37								
	g	Hsu, et al.; Q Optimized Lateral Free-Free Beam Micromechanical Resonators; Digest of Technical Papers, The 11 <sup>th</sup> Int. Conf. On Solid-State Sensors & Actuators (Transducers'01), Munich, Germany, June 10-14, 2001, pp. 1110-1113								
	h	Yasumura, et al.; Quality Factors in Micron- and Submicron – Thick Cantilevers; Journal of Microelectromechanical Systems, Vol. 9, No. 1, March 2000; pp 117-125								
	i	Peterson, et al.; Resonant Beam Pressure Sensor Fabricated With Silicon Fusion Bonding; 6th Int. Conference on Solid State Sensors and Actuators (Transduces '91), San Francisco, CA; 1991; pp 664-667								
	j	Abdelmoneum, et al.; Stemle	ss Wine-Glass N	ne-Glass Mode Disk Micromechanical Resonators; IEEE; 2003; pp 698-701						
	k	Piekarski, et al; Surface Micromachined Piezoelectric Resonant Beam Filters; Sensors and Actuators, A 91; 2001; pp 313-320								
	1	Lifshitz, et al.; Thermoelastic Damping In Micro- and Nanomechanical Systems; Physical Review B; Vol. 61, No. 8; February 15, 2000; pp 5600-5609								
				-Grained Polysilicon Flexural Beam Reso. 5; October, 2002; pp 499-504	onators; Jou	urnal of				

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#### INFORMATION DISCLOSURE ITATION

062020-1430 **Applicant** 

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Group

(Use several sheets if necessary)

#### 7-31-03 2834 **U.S. PATENT DOCUMENTS** Examiner Item Document Date Name Class Subclass Filing Date **Initials** Number If Appropriate 6,121,552 9-19-00 Brosnihan, et al. n 174 6-13-97 253 0 6,134,042 10-17-00 Dhuler, et al. 359 224 4-1-99 p 6,215,375 4-10-01 Larson, III, et al. 333 187 3-30-99 6,236,281 5-22-01 Nguyen, et al. q 331 154 9-21-99 r 6,238,946 5-29-01 Ziegler 438 50 8-17-99 S 6,239,536 5-29-01 Lakin 310 364 9-8-98 t 6,256,134 7-3-01 Dhuler, et al. 359 212 7-28-00 6,275,122 8-14-01 u Speidell, et al. 333 8-17-99 186 $\mathbf{v}$ 6,275,320 8-14-01 Dhuler, et al. 359 237 9-27-99 w 6,291,931 9-18-01 Lakin 310 364 11-23-99 X 6,296,779 10-2-01 Clark, et al. 216 66 2-22-99 OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, etc.) Lakin; Thin Film Resonators and Filters; IEEE Ultrasonics Symposium; 1999; pp 895-906 y Ruby, et al.; Ultra-Miniature High-Q Filters and Duplexers Using FBAR Technology; IEEE International Solid-State Circuits Conference; 2001; pp 120-121 & 438 Clark, et al.; High-Q VHF Micromechanical Contour-Mode Disk Resonators; IEEE; 2000; pp 493-496

BB Wang, et al.; VHF Free-Free Beam High-Q Micromechanical Resonators; Journal of Microelectromechanical Systems, Vol. 9, No. 3; September 2000; pp 347-360

Piazza, et al.; Voltage-Tunable Piezoelectrically-Transduced Single-Crystal Silicon Resonators on SOI Substrate; in Proc. IEEE Internatinal Microelectro Mechanical Systems Conference (MEMs '03), Koyoto, Japan, Jan. 2003

DD Pourkamali, et al.; A 600kHz Electrically-Coupled MEMs Bandpass Filter; MEMs '03, pp. 702-705

Pourkamali, et al.; SOI-Based HF and VHF Single-Crystal Silicon Resonators With SUB-100 Nanometer Vertical Capacitive Gaps; Transducers '03, Boston, MA; June 2003

No, et al.; Single-Crystal Silicon HARPSS Capacitive Resonators With Submicron Gap-Spacing; Solid State Sensors, Actuators and Microsystems Workshop; pp. 281-284, Hilton Head, SC; June 2002

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Group 2834

**U.S. PATENT DOCUMENTS** Examiner Item Document Date Name Class Subclass Filing Date Initials Number If Appropriate GG 6,348,846 2-19-02 von Gutfeld, et al. 333 201 10-14-99 HH 6,373,682 4-16-02 Goodwin-Johansson 361 278 12-15-99 II 6,377,438 4-23-02 Deane, et al. 361 278 10-23-00 IJ 6,391,674 5-21-02 Ziegler 438 52 12-28-00 KK 6,428,713 8-6-02 Christenson, et al. 216 2 10-1-99 6,429,755 LL 8-6-02 Speidell, et al. 333 197 1-30-01 MM 6,433,401 8-13-02 Clark, et al. 257 524 4-5-00 NN 6,480,645 11-12-02 Peale, et al. 18 385 1-30-01 00 6,485,273 11-26-02 Goodwin-Johansson 417 410.2 9-1-00 PP 6,495,892 12-17-02 Goodman, et al. 257 414 3-26-99 QQ 6,497,141 12-24-02 Turner, et al. 73 105 6-5-00 OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, etc.) RR Amini, et al.; Capacitive Accelerometer; IEEE International Solid-State Circuits Conference; 2000; pp 1-3 Ho, et al.; Through-Support-Coupled Micromechanical Filter Array; School of Electrical and Computer Engineering; Proc. IEEE International Micro Electro Mechanical Systems Conference (MEMS'04), Maastricht, The Netherlands, Jan. 2004, pp769-772 Pourkamali, et al.; Fully Single Crystal Silicon Resonators With Deep-Submicron Dry-Etched Transducer Gaps; Proc. IEEE International Micro Electro Mechanical Systems Conference (MEMS '04), The Netherlands, Jan. 2004, pp 813-Pourkamali, et al.; Electrostatically Coupled Micromechanical Beam Filters; Proc. IEEE International Micro Electro III Mechanical Systems Conference (MEMS '04), The Netherlands, Jan. 2004, pp. 584-587 VV Amini, et al.; A High Resolution, Stictionless, CMOS Compatible SOI Accelerometer with a Low Noise, Low Power, 0.25 µm CMOS Interface; IEEE MEMS'04, Jan. 2004, pp. 572-575 WW Humad, et al.; High Frequency Micromechanical Piezo-On-Silicon Block Resonators; IEEE; 2003 \* EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP § 609. Draw line through citation if not in

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# INFORMATION DISCLOSURE CITATION

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Examiner Initials	Item	Document Number	Date	Nar	Name		Subclass	Filing Date If Appropriate	
	XX	6,555,201	4-29-03	Dhuler, et al.		428	137	5-15-00	
						<u></u>			
	r			ling Author, Title, I		<del></del>			
	YY	Abdolvand, et al.; Thermoelastic Damping in Trench-Refilled Polysilicon Resonators; IEEE; 2003; pp 324-327							
	ZZ	Sundaresan, et al.; A 7-MHz Process, Temperature and Supply Compensated Clock Oscillator in 0.25µm CMOS; Proc. of International Symposium on Circuits and Systems (ISCAS) 2003, vol. 1, pp. 693-696, May 2003							
	aa	No, et al.; Single-Crystal Silicon HARPSS Capacitive Resonators With Submicron Gap-Spacing; Solid-State Sensor, Actuator and Microsystems Workshop, Hilton Head Island, South Carolina, June 2-6, 2002; pp 281-284							
	bb	Balaraman, et al.; Low-Cost Low Actuation Voltage Copper RF MEMS Switches; IEEE; 2002; pp 1225-1228							
	СС	Dalmia; Design of Inductors in Organic Substrates For 1-3 GHz Wireless Applications; IEEE; 2002; pp 1405-1408  Dalmia, et al.; High-Q RF Passives on Organic Substrates Using a Low-Cost Low-Temperature Laminate Process; Proc. 2002 Symposium on Design, Test, Integration and Packaging of MEMS/MOEMS (DTIP 2002), Cannes, France May 2002, pp. 660-669							
	dd								
	ee	Ayazi, et al.; A High Aspect-Ratio Polysilicon Vibrating Ring Gyroscope; Solid-State Sensor and Actuator Workshop, Hilton Head Island, South Carolina, June 4-8, 2002; pp 289-292						tor Workshop,	
	ff	Ayazi, et al.; High Aspect-Ratio Dry-Release Poly-Silicon MEMS Technology for Inertial-Grade Microgyroscopes; IEEE; 2000; pp 304-308							
	gg	Ayazi, et al.; Design and Fabrication of A High-Performance Polysilicon Vibrating Ring Gyroscope; IEEE; 1998; pp 621-626							
	hh	Selvakumar, et al.; A High Sensitivity Z-Axis Torsional Silicon Accelerometer; The International Electron Devices Meeting; San Francisco, CA; Dec. 8-11, 1996							
	ii	Hao, et al.; An Analytical Model for Support Loss in Micromachined Beam Resonators With In-Plane Flexural Vibrations; Sensors and Actuators, A 109; 2003; pp 156-164							
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		OTHER DOCUMENTS (In	cluding Author, T	itle, D	ate, Pertinent Pages, etc.)				
	ij	Pourkamali, et al.; High-Q Single Cranm Transduction Gaps; Journal of Michael Crans (1998)	ystal Silicon HARPS croelectromechanica	SS Capa al Syste	acitive Beam Resonators With ms, Vol. 12, No. 4; August 20	n Self-Aligned Sub-100- 003; pp 487-496			
	kk Ayazi; The HARPSS Process for Fabrication of Precision MEMS Inertial Sensors; Mechatronics 12; 2002; pp 1199								
	ll Ayazi; A HARPSS Spolysilicon Vibrating Ring Gyroscope; Journal of Microelectromechanical Systems; Vol. 1 2; June 2001; pp 169-179								
n		Ayazi, et al.; High Aspect-Ratio Combined Poly and Single-Crystal Silicon (HARPSS) MEMS Technology; Journal of Microelectromechanical Systems; Vol. 9, No. 3; Sept. 2000; pp 288-294							
1	nn Ayazi, et al.; High Aspect-Ratio Polysilicon Microma				ning Technology; Sensors and Actuators; 87; 2002; pp 46-51				
(	oo Yazdi, et al.; Micromachined Inertial Sensors; Proce				e IEEE; Vol. 86, No. 8; Augu	st 1998; pp 1640-1659			
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